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DISTILLERS' GRAINS – WHAT ARE WE GOING TO DO WITH THEM?

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Ethanol production is on the rise in Manitoba to meet the requirements of legislation designed to increase the use of ethanol-blended gasoline. A co-product from ethanol production is dried distillers' grains with solubles (DDGS) that has the potential to be used in livestock feeds.

To date, most of the research work on DDGS has been based on corn distillers dried grains with solubles. These research reports have indicated that this product can be successfully included in swine rations without reductions in performance (e.g. Whitney et al. 2006). However the inclusion rates are sometimes debated since concerns have been raised about carcass quality when the corn DDGS levels are deemed to be too high in rations (> 10%) especially for growing pigs. Where the DDGS seem to have the greatest impact is on phosphorus levels in the diet. The phosphorus digestibility in DDGS is high for pigs; much higher than in soybean meal and corn. This suggests that DDGS can replace most of the inorganic phosphorus added to pig diets, could reduce diet costs and possibly reduce excretion of phosphorus in manure without compromising performance.

An issue that arises is when discussing DDGS as the variability in nutrient composition, physical characteristics and nutrient digestibility that occur among DDGS sources. Shurson (2007) reports that swine prefer a light, golden colored DDGS that is indicative of less heat damage during drying. If there are differences in corn sources, what is the situation going to be in Manitoba when wheat-based DDGS become readily available?

Nyachoti et al. (2005) reported that wheat DDGS could be utilized in pig diets. However, there is not a lot of information about wheat DDGS and additional research is needed to understand the true nutritive value of this product and how it can fit into swine rations in Manitoba.

Therefore, it appears that there is a fit for wheat DDGS in swine diets. However, there is a need to obtain the necessary nutritional information on the product and to have a consistent product for pig feeds. Once the nutritional information is established and issues of *Fusarium* mycotoxins are resolved, pricing can be established and then we will have a more clear idea as to what will be the inclusion levels of wheat DDGS in swine rations.

References:

Whitney et al. (2006) J. Anim. Sci. 84:3356-3363
Nyachoti et al. (2005) J. Sci. Food Agric. 85:2581-2586
Shurson (2007) Manitoba Swine Seminar proceedings 21:161-166

FEEDING CATTLE DURING MANITOBA WINTERS

Manitoba cattle are subject to considerable environmental stress during the winter months. They must adapt to prolonged cold temperatures and also survive acute conditions such as blizzards and sudden, extremely cold weather. Animals in good body condition with access to shelter or a windbreak are better able to withstand both the acute and prolonged stresses.

During a sudden snap of very cold weather, the temperature may drop below the animal's "lower critical temperature" (LCT). At this point, heat production of the animal must increase immediately to prevent a drop in body temperature. The LCT refers to the effective temperature. Rain, melting snow or wind will significantly increase the coldness of the environment. For example, a -5°C temperature with a 40 km/hour wind speed is equivalent to -20°C with no wind.

The LCT varies depending upon the weight, condition and energy intake of the cattle. Dairy cows and feedlot cattle on high grain rations have a very low LCT (-30°C to -45°C) because of their high feed intake and metabolic rate. The LCT for pregnant beef cows, dry dairy cows and growing calves, in good body condition, is between -10°C and -25°C. Young calves, from birth to 3 weeks of age have a LCT of +13°C. Dairy calves from 3 weeks old to weaning have a LCT of +1°C.

Animals in good body condition are better able to tolerate extreme cold. For example, thin cows with a BCS of 1-2 have a LCT of -17°C while cows in good condition with a BCS of 3 have a LCT of close to -25°C. This is another good reason for feeding thin cows separately from the rest of the herd. Providing a wind break and/or shelter, ensuring cattle have good body fat stores and feeding additional energy (ie. grain) will help all cattle survive acute cold stress with a minimum of suffering and long term effects.

The effect of acute cold stress on the feed bill is relatively small compared to the effects of acclimatization. These effects last for the entire winter period even when conditions are relatively mild. When the temperature drops and remains below the thermoneutral, or comfort, zone (15°C - 20°C), certain adaptive changes occur. Hair coat becomes thicker and longer. The metabolic rate increases. Feed intake can increase by up to 30%. A faster rate of passage, however, means that the digestibility of forages is reduced in cold weather (cattle are getting less energy from a given amount of feed).

The overall result of acclimatization is to increase the energy requirements by approximately 10% for every 10°C drop in effective temperature below the comfort zone. Cows in good condition can increase their consumption of good quality hay by about 10 lbs maximum and this helps to meet part of the increased energy requirement. After this, the energy must be supplied as grain or as better quality forage.

Milking dairy cows are typically housed indoors and fed high energy diets. They are therefore relatively immune to the effects of cold stress. The acclimatization process which occurs in all cattle may increase the dry matter intake by 2-3 kg/cow/day. If milking cows are already consuming their limit for feed, milk production may drop if the energy density of the diet is not increased. There is very little research into the effect of cold stress on lactating dairy cows. Replacement heifers and dry cows experience cold stress in a similar way to beef cattle.

FEEDING SUNFLOWER SEEDS TO DAIRY COWS

Both oilseed and confectionary sunflower seeds become available periodically to Manitoba dairy producers. Both are good sources of protein and energy. Oilseed sunflowers contain about 20% crude protein, 40% oil and 3.3 mcal NE_L/kg. Confectionary sunflowers (black and white striped seed) contain slightly more protein (23-24%) but less oil (25%). The high oil content in both types makes sunflowers an excellent energy supplement for early lactation, high producing cows.

There are several reasons to consider feeding sunflowers and other fat sources. Small increases in milk production (1 to 2 kg per 0.45kg added fat) and milkfat (.2-.3 percentage points) often occur. Conversely, a decrease in milk protein (.05-0.15 % percentage points) is usually noted. Providing energy in a very dense form allows cows in early lactation (ie. those who have already maximized dry matter intake) to improve their energy balance having a positive effect on body condition, reproduction and incidence of ketosis.

The amount of sunflowers which can be used in a ration is limited by its oil content. Excessive oil, particularly the unsaturated type in sunflowers, may affect rumen fermentation leading to lower fibre digestion and a subsequent reduction in milkfat. The amount of sunflowers which may be fed depends upon the other fat sources in the diet. The total fat in the diet should not exceed 7-8% - with the first third (2.5-3%) coming from forages and grain. Cows can then be supplemented another 1.5-2 percentage points fat from commodity fats (eg. sunflowers, soybeans, tallow). If required, the ration fat can be increased to the maximum of 7-8% using specialty fats which are inert in the rumen and thus do not affect rumen fermentation.

If no other fat sources are included in the base ration (eg. corn DDG, soybeans, tallow), sunflower seeds can be fed to a maximum rate of 4 lbs (oilseed) and 6 lbs (confectionary). This provides an additional 1.5 lbs fat which should increase the total fat content in the diet to approximately 5%. In addition to following the maximum feeding rates, it is important to follow the recommended ration adjustments whenever any fat is added to a dairy diet. They include providing sufficient fibre (>20% ADF) and UIP, increasing calcium and magnesium levels to 0.9 and 0.35% respectively, introducing the fat source gradually and limiting the amount of supplemental fat fed to fresh cows 3-5 weeks postcalving. Sunflowers can be fed whole, rolled or slightly cracked. Avoid fine grinding. With the current prices of barley ($150/T) and canola meal ($160/T), the value of sunflower seeds is approximately ten cents per lb.

Research was conducted at the University of Alberta to determine the effects of feeding raw and roasted sunflower seeds on the fatty acid composition in milk (Kroeker and Christensen, Western Canadian Dairy Seminar, 2005). The oil in sunflower seeds contains primarily unsaturated fatty acids, in particular linoleic acid which can be converted by the dairy cow to conjugated linoleic acid (CLA). CLA is believed to be beneficial to human health. Feeding 1.5 kg per day of whole roasted sunflower seeds resulted in substantially higher milk concentrations of CLA than did feeding a control diet (no sunflowers), 0.75 kg/day of whole raw sunflower seeds or 0.75 kg/day of whole roasted sunflower seeds. No differences in intake, milk production or milk composition were reported between treatment groups. Milk protein content was significantly reduced in all groups being fed sunflower seeds.

RUMENSIN CALCULATION WORKSHEET

Information Required

Weight of Cattle _____ kg (a)

Monensin Level Required

1. Adaptation 11 mg/kg _____
2. Cocci Control 22 mg/kg _____ (b)
3. Feed Efficiency 33 mg/kg _____

Level of Monensin Activity in Purchased Medicated Product _____ mg/kg (c)
(read off feed tag)

Calculations

Dry Matter Intake (DMI)

= wt of cattle, kg (a) x DMI, % BW *

= _____ kg x _____%

= _____ kg (d)

Mg Monensin Required/HD/Day

= DMI, kg (d) x Monensin required (b)

= _____ kg x _____mg/kg

= _____ mg (e)

Kg of Medicated Product to Feed

= Monensin required/HD/day,mg (e)
Level of Monensin in Medicated Product, mg/kg (c)

= _____ mg
mg/kg

= _____ kg

*Use 2% of body weight for pregnant cows and replacement heifers, 2.5% for lactating cows and feeders.

SAMPLE:

QUESTION: A producer has cows weighing 600 kg. A product with 400 mg monensin activity/kg is available. How much product should be fed daily for cocci control?

Information Required

Weight of Cattle 600 kg (a)

Monensin Level Required

1. Adaptation 11 mg/kg _____
2. Cocci Control 22 mg/kg 1 (b)
3. Feed Efficiency 33 mg/kg _____

Level of Monensin Activity in Purchased Medicated Product 400 mg/kg (c)
(read off feed tag)

Calculations

Dry Matter Intake (DMI)

= wt of cattle, kg (a) x DMI, % BW *

= 600 kg x 2 %

= 12 kg (d)

Mg Monensin Required/HD/Day

= DMI, kg (d) x Monensin required, mg/kg (b)

= 12 kg x 22 mg/kg

= 264 mg (e)

Kg of Medicated Product to Feed

= Monensin required/HD/day,mg (e)
Level of Monensin in Medicated Product, mg/kg (c)

= 264 mg
440 mg/kg

= 0.66 kg

EFFECT OF HAY FEEDING METHODS ON COW PERFORMANCE, HAY WASTE AND WINTERING COST

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Excerpts taken from: 2005 Beef Cattle and Range Research Report, NDSU, March 2005.

The most common method for putting up hay in North Dakota is in the large, round bale. Rolling round bales out on the ground has been the most common hay feeding method. However, power takeoff-operated bale processors are becoming more popular as labor savings become more important. A number of different bale feeders are available commercially, and manufacturers recently introduced a tapered-cone round bale feeder.

Considering the three methods available for feeding hay during the winter, this study was designed to compare cow wintering performance, hay consumption necessary to maintain cow body condition, labor inputs, wintering cost and hay waste when hay was rolled out on the ground, shredded with a bale processor on the ground or fed in a tapered-cone round bale feeder.

Three hundred and sixty crossbred cows in the third trimester of pregnancy and averaging 1,343 pounds were assigned randomly to one of 12 five-acre wintering lots at the Dickinson Research Extension Center. The study consisted of four pen replicates per treatment.

1. Convention method – round bales fed by rolling bales on the ground.
2. Round bales shredded with a power takeoff-driven bale processor and fed on the ground.
3. Round bales fed by placing the bale in a tapered-cone round bale feeder.

For years one and two of the study, alfalfa grass-mixed hay was fed. During the last year of the study, oat hay was used. Cows were fed to maintain or improve their starting body condition prior to calving. Cow weight change, hay intake and body condition score change are shown below.

Table 1. Three year effect of hay feeding method on cow performance and hay intake.

	Bale Rollout	Bale Processor	Cone Feeder
# cows	120	120	120
Days fed	59	59	59
Starting wt, lb	1358	1352	1363
ADG, lb	0.85	1.12	1.34
BCS Start	5.88	5.77	5.94
BCS End	5.83	5.80	6.01
BCS Change	-.04	.029	.07
Rib Fat Depth Change			
Year 1	-0.8	-0.53	+0.3
Year 2	+1.32	+1.18	+2.22
Year 3	-0.72	-1.42	-1.02
Hay/cow/day, lb			
Year 1	30.9	29.9	26.3
Year 2	40.9	42.7	37.1
Year 3	31.5	35.2	30.2

Hay intake to maintain body condition was greatest for those cows fed with the bale processor, intermediate when bales were rolled out and the least when cows were fed using a tapered-cone bale feeder. On average, when compared with the tapered-cone feeder, 5% and 15.3% more hay was fed per cow using the roll-out and bale processor methods, respectively.

Waste contributed to the increased amount of hay required among the roll-out and bale processor cow groups. An estimate of waste suggested type of hay and firmness of bales played a significant role in success with the tapered-cone bale feeder. When dense alfalfa-grass hay bales were tied tightly and strings were not removed for feeding, waste around the tapered-cone bale feeder was 4.3 to 5 times less than either the roll-out or bale processor methods, respectively. However, when loose, poorly tied oat hay bales were fed in the tapered-cone bale feeder, waste was numerically decreased but did not differ significantly with the bale processor. During the three year period, these data suggest hay waste is minimal with the tapered-cone bale feeder when bales are dense and adequately tied, and strings are not removed prior to feeding.

Economic model analysis suggest feeding with a tapered-cone round bale feeder offers substantial cost savings per cow arising from reduced hay consumption, equipment cost and feeding time. Wintering cost per cow for the 100-cow reference herd was $109.10, $127 and $100.30 for rolling out bales, shredding with a bale processor and feeding bales in a tapered-cone feeder.

Table 2. Two year economic analysis comparing hay feeding methods for 100 and 300 head cow herds.

	Round bale rollout	Round Bale Processor	Tapered Cone
Hay fed, tons			
100 cow herd	232.0	242.6	210.5
300 cow herd	695.9	727.9	631.4
Total herd hay cost, $			
100 cow herd	$9,858	$10,311	$8,945
300 cow herd	$29,574	$30,934	$26,834
Equipment/Tractor cost			
100 cow herd	$1,044	$2,390	$1,081
300 cow herd	$3,131	$5,564	$3,243
Total expense			
100 cow herd	$10,902	$12,701	$10,026
300 cow herd	$32,705	$36,497	$30,077
Cost per cow			
100 cow herd	$109.1	$127.0*	$100.3
300 cow herd	$109.1	$121.7*	$100.3

- Difference was due to variation in the rate of depreciation used for the two herd sizes in the economic model.

Using a bale processor to shred bales into windrows before feeding was the most expensive due to greater equipment ownership cost and greater hay intake per cow necessary to maintain comparable condition, compared with the tapered-cone bale feeder. Rolling bales out and shredding into windrows with a bale processor increased hay consumption and winter feed cost.

Using dense, properly tied bales, the tapered-cone feeder was a superior winter hay feeding method when compared with either rolling bales out on the ground or shredding on the ground with a bale processor. Tapered-cone bale feeders reduced waste, decreased the amount of hay required/cow from 5% to 15.3% and decreased wintering cost/cow while maintaining body condition. Economic analysis for the three wintering seasons identified an economic advantage in using the tapered-cone round bale feeding method.